

Application No.: 10/612160
Amendment dated: August 2, 2004
Reply to Office action of May 4, 2004

REMARKS/ARGUMENTS

As explained in paragraph 0003 of the Applicants' specification, in the prior art exemplified by FIGs. 3(I) - 3(III), as the tapered surfaces of a roller chain bushing are formed, the remaining portions of the internal circumferential surfaces are not restrained, causing deformation of surface X4. This allows the central axis of the internal circumferential surface X4 to be displaced relative to the central axes of the tapered surfaces X5 and X6. The result is increased friction between the bushing and its associated pin in the roller chain, and also a reduction in fatigue strength of the inner and outer plates of the chain.

The same kind of deformation can occur in Bellido. In Bellido, as in the present invention, the outer surface of the blank is controlled by the die. Moreover, the punches have tapered portions 13a and 13b similar to those of the present invention. However, there is an important difference. In accordance with the invention, the small diameter end portions of the punches are cylindrical, and are press-fit into the cylindrical blank. In Bellido, on the other hand, the end portions 10a and 10b are tapered. Consequently, they cannot restrain the cylindrical part of the internal surface of the bushing as the tapered internal surfaces of the bushing are being formed by the punches.

Another difference between the present invention and Bellido is that, in accordance with the invention, during the punching operation, the ends of the blank are restrained by axially movable cylindrical members 4 and 5, as shown in FIG. 2. Bellido has no corresponding members, and does not restrain the ends of the blank.

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The above-described distinguishing features of the Applicants' invention are set forth in claim 1, as currently amended, in the following language:


"a pair of punches having small diameter cylindrical end portions which have the same diameters as the inner diameter of said hollow cylindrical blank. . .

"the small diameter cylindrical end portion of each punch projecting axially in a first direction from a narrow end of the tapered portion thereof. . .

"restraining both end surfaces of the press-fitted hollow cylindrical blank with cylindrical punch side members surrounding the large diameter portions of the punches and movable axially on the outsides of the punches"

The features defined in the above limitations in claim 1 are not present in Bellido, and there use in the formation of a bushing is not suggested in any of the art of record. We respectfully submit that the invention as now defined in claim 1, as amended, is neither anticipated, nor shown to have been obvious, and request favorable reconsideration and allowance of this application.

Respectfully submitted,
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